KEY ISSUES IN DESIGN OF NONLINEAR TRANSMISSION LINES*

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Dielectric nonlinear transmission lines (NLTLs) have demonstrated great potential in RF generation. Their main characteristic is that they do not require an electron beam to operate. However, there are some key points in their operation not clarified yet. For instance, they generate output oscillations with frequency at half the line Bragg frequency for a high number of sections (n>30); however, for smaller n (=10) this frequency appears to be near the Bragg frequency[1]. In this work, it will be demonstrated that this effect has to do with the spreading of train of solitons travelling through a long line (i.e. with a high number of sections). In addition, it will be shown that for a line with higher n, the nonlinearity factor k of the dielectric can be very close to unity, which means that capacitors with more stable capacitance can be used. This effect has been observed in practice, as it is easy to produce a train of solitons with higher amplitudes for a line built with a large number of sections[2]. Finally, the points discussed above will be checked experimentally by measuring the standard FFT of the signal along a varactor diode NLTL made with 30 sections, operating at the output frequency around 50 MHz.

1. N.S Kuek, A.C. Liew, E. Schamiloglu, and J.O. Rossi, "Pulsed RF on a Nonlinear Capacitive Transmission Line," IEEE Trans. on Dielectrics and Electrical Insulation, vol. 20, no. 4, pp.1129-1135, Aug. 2013.
2. F.S. Yamasaki, J.O. Rossi, and J.J. Barroso, "RF Generation Using Nonlinear Transmission Lines for Aerospace Applications, in Proceedings of the SBMO/IEEE MTT-S International Microwave and Optoelectronics Conference, Aug. 2013, pp. 1-5.

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